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SCIENCE

VOL. 98 FRIDAY, AUGUST 13, 1943 No. 2537

Marine Biological Laboratories: DR. THOMAS BARBOUR 141

The Number of Scientific Men Engaged in War Work: DR. LEONARD CARMICHAEL 144

Obituary:
William Shirley Bayley: DR. M. M. LEIGHTON. *Recent Deaths* 145

Scientific Events:
Industrial Research in Great Britain; The Wartime Conference of the American Public Health Association; Appeal of the War Policy Committee of the American Institute of Physics; The Office of Scientific Research and Development; Manpower Problems in the Chemical Industry 146

Scientific Notes and News 149

Discussion:
The Science Mobilization Bill: SENATOR HARLEY M. KILGORE. *Salmon Conservation:* DR. GEORGE A. ROUNSEFELL. *Transliteration Once More:* PROFESSOR PAUL HANLY FURFEY. *Suggested Change in Designation of "Renin-Activator" (Hypertensinogen) to Renin-Substrate (a_2 Globulin):* DR. IRVINE H. PAGE and OTHERS 151

Scientific Books:
Three Mathematical Text-books: PROFESSOR C. N. MOORE. *Biochemistry and Morphogenesis:* PROFESSOR DOUGLAS WHITAKER 154

Special Articles:
Thiouracil in the Treatment of Thyrotoxicosis: DR. ROBERT H. WILLIAMS and DR. GROSVENOR W. BISSELL. *Effect of Various Chemical Agents Affecting Permeability of the Mucosa on the Formation of Ulcers:* DR. R. L. DRIVER, G. S. DOZIER and H. C. DENHAM 156

Scientific Apparatus and Laboratory Methods:
On the Staining of Yeast Spores: PROFESSOR L. S. MCCLUNG. *Enzymatic Cleaning of Berkefeld Candles Used in the Filtration of Human Blood Plasma:* DR. BERNARD WITLIN 159

Science News 10

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MARINE BIOLOGICAL LABORATORIES

By Dr. THOMAS BARBOUR

MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY

IN spite of the war, interest in tropical marine biology has not waned. Indeed, there are a number of problems directly connected with the war effort which can only be attacked by making use of the facilities offered by a marine biological laboratory. The Bermuda Biological Station for Research is closed for various obvious reasons. The Bermuda Aquarium continues open to the public and I see no reason why that should not be a successful enterprise for a long time to come, inasmuch as our Armed Forces to-day are helping support it by their attendance, and as soon as the war is over there is every reason to believe that Bermuda will resume its importance as a tourist center. I am proud to have had a finger in closing up the Biological Station at the Dry Tortugas, where the cost per day per investigator was something the less said about the better.

It is becoming increasingly obvious that the question of economy must be given more and more consideration as funds available for research become more and more restricted. It seems to me clear, therefore, that all our resources, both intellectual and financial, should be devoted to develop that laboratory which offers the optimum biological opportunities with the greatest accessibility, since accessibility means least transportation costs for both investigators and shipments of material. The laboratory recently opened by the University of Miami at Belle Isle, near Miami Beach, answers these requirements. The premises at present occupied by the station are temporary and rather limited in scope, but opportunity for economical expansion is right there and is assured. The director of this station is Dr. F. C. Walton Smith, whose address is care of the University of Miami, Coral Gables, Florida. I know that Dr. Smith will be glad to answer inquiries regarding facilities for research,

and indeed he has prepared an excellent descriptive pamphlet outlining the extraordinary variety of environmental conditions near at hand from which I am going to quote. To all intents and purposes, the Gulf Stream is as conveniently accessible to this marine station as it was to the Dry Tortugas. Ocean beaches, mangrove swamps, wide areas of coral reefs in water sufficiently shallow so that collecting with a diver's helmet is perfectly feasible, as well as wide areas of sand flats with shallow water, are near at hand. The sea is as deep off shore as it is elsewhere and the edge of the continental shelf is not far distant.

Innumerable buses per day pass the door of the laboratory and thus metropolitan Miami may be reached in a few moments. I don't have to add that railway service and air connections link Miami with the rest of the country in a matter of hours. Thus the cost of reaching this station from any point in the United States will always be much less than reaching the station in Bermuda should it ever be reopened, and moreover, while the Bermuda fauna is tropical, nevertheless in many directions it is distinctly depauperate, as is well known. The reverse is distinctly the case with the station in Florida. Dr. David Fairchild and I visited the laboratory about two months ago. Our visit was motivated by having read "Opportunities for Subtropical Marine Investigations," issued by the university. We were astonished that right here under our very noses had been set up a laboratory which not only deserves the support of the foundations, but of all the societies associating investigators interested in this field. Besides Dr. Walton Smith, chairman of the advisory committee of the laboratory and its director, Dr. Robert H. Williams, a botanist, is assistant director. Dr. Morton Miller and Dr. Elmer Hjort are also on the staff of the station.

I quote now from the prospectus:

The laboratory is situated upon an island of the Venetian Causeway connecting the cities of Miami and Miami Beach. This is a most convenient location for several reasons. Not only may it be reached by a ten-minute automobile drive from Miami, but public transportation services have established a passenger stop at the entrance of the grounds. The grounds themselves are a portion of a large enclosed estate so that visiting investigators may be assured of privacy. Living quarters are available adjacent to the laboratory and there are excellent hotels within walking distance. The advantages of accessibility include the possibility of obtaining supplies at short notice from chemical and other houses in Miami or from the university, situated at Coral Gables, immediately outside Miami.

Although within the city limits of Miami Beach and adjacent Miami, the laboratory is conveniently located with respect to collecting grounds. On the sea-wall bordering the laboratory grounds numerous large urchins, sponges, corals, alcyonaria, oysters, and barnacles flourish and reproduce during practically every month of the year. The water in which these forms grow is pumped directly into the laboratory supply pipes without the intervention of a closed circulation system.

Accommodations in the laboratory are at present sufficient for a limited number of workers only, but are so organized as to allow for considerable expansion at short notice. Individual rooms for investigators are provided in addition to the tank room with its water table. For collection from more distant grounds a fast 22-foot launch is provided. The usual collecting equipment such as dredges and tow-nets is used and, in addition, the diving helmet has been found a convenient and valuable aid in investigating bottom-living forms such as those of the coral reefs in the warm water to a depth of forty feet.

Undergraduate classes in marine botany and zoology have been held in the summer school of the university, as well as in the regular semester for some years past, and these may be continued in curtailed form during the summer of 1943.

For those engaged in certain fields of tropical marine investigation research grants may, under approved circumstances, be available from various sources. Further information, covering laboratory and living accommodation, may be obtained by applying to the director, giving a description of the nature of the proposed investigations and approximate duration of the visit.

Within an area readily accessible to the laboratory is to be found a wide variety of habitats including shores of coral or sedimentary rock; gold and white beaches of shell and coral sand; shallow bays and inlets lined with the red mangrove, whose roots provide shelter for a varied community of plants and animals; the slimy marl or calcareous ooze, which supports the growth of commercial sponges; the outer line of reefs and the inner islands and flats, separated by the inner and outer channels from the shores; and, within a short distance from land, the deep blue waters of the Gulf Stream.

The fauna consists of sub-tropical forms extending north from Miami, together with numerous tropical species which overlap and find their northern limit in this latitude. Conspicuous among the latter are the massive reef building corals and the smaller inshore forms, many of which, like *Isophyllia, Oculina* and *Meandrina,* may be kept alive in the laboratory for considerable periods, and which are therefore well adapted for experimental work. No less interesting are the massive brain corals such as *Diploria, Montastrea* and *Dichocoenia.* Not only are these corals interesting in themselves, but they provide a shelter for calcareous tube-worms, boring molluscs and crustacea, and house in their crevices many brittle stars and occasional burrowing holothurians. One of the interesting inhabitants is the Atlantic palolo-worm, *Eunice fucata,* which liberates its reproductive segments in swarms to the surface of the ocean in an annual rhythm, the climax of which occurs at the corresponding tide and season each year.

A large and important group are the alcyonaria. Large groves or underwater shrubberies of these fans and whips are found in shallow water, and are associated with

sponges, holothurians, six-rayed stars, basket stars and various tropical mollusca.

The echinoids are plentiful and include *Lytechinus variegatus,* which litters the offshore flats, and *Centrechinus,* whose egg should interest embryologists. Sand-dollars, heart-urchins and the beautiful golden *Moira atropos* from muddy bottoms are also common. The stars range from the large *Oreaster* to the small red *Echinaster.* Below the surface of sand lives the handsome *Luidia.* All three are very plentiful.

Some of the larger crustacea live in holes or burrows, as in the case of the stone-crab and the "sand-lobster," *Scyllarides equinoctalis.* The Florida crayfish, *Panulirus,* is plentiful and is remarkable for its unusual breeding habits. There are numerous species of the smaller crustacea.

Clumps of *Sargassum* wood which drift inshore in quantity afford startling illustrations of protective mimicry in their associated nudibranchs, crabs and fish.

A particularly rich habitat is that of the piling and wharf. Coelenterates, sponges, bryozoa, tunicates and barnacles are easily collected without leaving the laboratory grounds, by means of devices developed by recent investigators, and they afford a splendid opportunity for the study of the previously rather neglected field of the biology of sedentary and fouling organisms.

The large loggerhead sponge forms a habitat in itself, supporting the growth of an enormous variety of commensals including annelids, crustacea, gastropods, coelenterates, tunicates and even barnacles.

Fishes of southern Florida exist in enormous variety and range from the marlin and sailfish down to the delicate blue-heads and multicolored inhabitants of the reef, which are equally numerous in variety and quantity. Among the mammals are porpoises and the vegetarian sea-cows.

The great variety of animals is equalled by the abundance of algae which, together with some marine seed-plants, flourish in this region. Among the latter are *Thalassia, Cymodocea* and *Halodule* which replace the familiar eel-grass of northern waters.

Blue-greens are abundant in the brackish water along the canals draining the Everglades area, and in the tidal pools filled with decaying vegetation.

Green algae show more coenocytic forms than are found in more temperate zones. The delicately beautiful *Acetabularia* and the bushy *Batophora* are among the most common of the littoral greens. The Valoniaceae are well represented by the beautiful *Anadyomene* and *Dictyosphaeria* and by several species of *Valonia,* which lends itself so well to physiological studies. The Codiaceae are very abundant, especially the lime-encrusted *Halimedas, Penicillus,* and others which almost cover some areas of shallow water. The Caulerpaceae include eleven or more species of the fascinating fern-like Caulerpas.

Although no massive browns of the Laminariales occur here, there are several attached and floating species of *Sargassum* and other Fucaceae, along with the well-known Dictyotas, *Zonaria* and *Padina.*

The red algae are amazing in their numbers, variety and beauty, becoming a delight to the collector and a challenge to the taxonomist. From the delicate Bangiales, to the lime-encrusted *Corallinas* and the tiny *Ceramiums,* every order is well represented. There are at least twenty-three genera of Rhodomelaceae, ten of Ceramiaceae. Many are easily collected at low tide, some are dredged, and many more are washed near or on shore in the drift. The delicate *Dasya* flourishes near the spiny *Acanthophoras* and *Digenia.* Many square miles of the shallow bays are covered with species of reds, some of which may prove commercial sources of agar.

The algologist will find in South Florida the materials, habitats, and equipment for a wide variety of physiological, taxonomic and ecological investigations.

I do not think that anything more need be said to prove my point. Not long since I had the pleasure of making a little address, presenting the Alexander Agassiz Medal of the National Academy of Sciences to Columbus O'D. Iselin. To my delight, I found, conversing with him, that he had visited this station very recently and was as completely convinced of the excellence of the opportunities presented as I was. I feel quite sure that he would endorse all the statements which I have made. Many persons forget that some years ago a most excellent marine aquarium was opened at Miami, not far from where the station is located. Were it open to-day it would be self-supporting. It would have still been open to-day except for the fact that the property on which it was situated became so extremely valuable that the institution simply could not continue operations. Those boom days are past and the area has shaken down now, so that there is little reason to believe that financial convulsions causing sudden fluctuations in land values will be likely to occur in the future. Rebuilding and reopening the aquarium with the idea of its being supported by admission fees to be paid by the public would be a useful adjunct to the station and a great addition to the educational and entertainment resources of the area. I believe that this is certain to come in the future. In the meantime, to all American biologists interested in opportunities to conduct investigations in marine zoology or physiology and assorted disciplines, here is the answer to prayer.

I hope that Dr. Walton Smith will not object to my interjecting myself into his affair in this way. The sooner, however, that this matter begins to be talked about and the sooner these opportunities are appreciated, the sooner will adequate financial support come forward to aid this project. There is no reason to reopen the Bermuda station and certainly no object in opening another tropical station for North American biologists.

THE NUMBER OF SCIENTIFIC MEN ENGAGED IN WAR WORK

By Dr. LEONARD CARMICHAEL

DIRECTOR OF THE NATIONAL ROSTER OF SCIENTIFIC AND SPECIALIZED PERSONNEL AND PRESIDENT OF TUFTS COLLEGE

A NUMBER of statements have appeared attempting to estimate the total number of scientific men employed in the war effort. A request has been received in the office of the National Roster from the editor of SCIENCE requesting a statement on this matter.

In the opinion of the staff of the National Roster, no satisfactory quantitative statement can be made concerning this question because any one numerical answer given will be almost entirely a function of the definition of the term "scientific man" adopted and of some other special assumptions. For example, are all physicians, dentists, veterinarians, pharmacists and osteopaths scientific men? Are social scientists as a group or are only certain social science areas to be included? Are all individuals who are now living who are known to be graduates of accredited institutions with degrees in engineering or science to be considered as scientists no matter when the degrees were received or what the present occupations of the individuals in question may be?

If the medical sciences and the social sciences are eliminated, the best estimate that the Roster has been able to bring together is that there are between 400,000 and 500,000 trained or qualified scientific men and women in the country. If we take certain typical professions, such as segments of the engineering profession and of chemistry, in which we have some satisfactory empirical data, there is reason to believe that over three fourths of this total number may be formally described as engaged directly or indirectly in war work. This estimate, of course, includes those who are in the Army and Navy and who use their scientific training not necessarily in the scientific specialty for which they were prepared but who are using mathematics and other tool subjects in special military tasks. It must be pointed out that of the scientists not actively engaged in war work many are overage, physically incapacitated or for personal reasons not available for scientific work.

A typical example of the difficulty of making an estimate of the number of scientific men in war work may be found in an illustration from the field of physics. Experience of the National Roster indicates that the physicists of the country are as well organized, if not better organized, than any other professional scientific group. It is also probably true that the National Roster has more complete records concerning the members of the profession of physics than in any other field. From the first, however, the physicists themselves have found it difficult to establish a fully satisfactory definition of what constitutes a physicist. A minimum definition of a professional physicist has been presented by the physicists as an individual with at least a master's degree or one possessing equivalent qualifications based on a combination of training and experience. There are somewhat more than 7,000 such men and women in America. In spite of this definition, many students with bachelor's degrees whose major work was done in physics have been employed in war research and as college teachers and as such have been treated by the National Roster as professional physicists. The total of this group, if added to the 7,000 given above, might justify the statement that there are probably 11,000 physicists. On the other hand, if the definition of scientist adopted indicates an ability to do advanced independent research, it is probable that there are not more than 2,000 or, at the most, 3,000 physicists in America. Thus the problem of definition makes it extremely difficult to answer the question, "How many scientists are engaged in war work." It may also be added that the determination of what is and what is not war work is not clearly definable and the determination made concerning this matter in one set of circumstances does not necessarily apply to some other set of circumstances. Added to all this is the further fact that a good number of scientists apportion their working time to different projects. It should also be mentioned that in spite of the fact that the Roster at one time was able to obtain the number of scientists and engineers employed in three fourths of the plants of the country engaged full or part time in the war program, it is still not easy to make any accurate guess concerning the total number of scientists actually employed in the Army, the Navy and in war industry.

Probably the most accurate statement that could be made with respect to the number of scientists engaged in war work is that the scientific and technological mobilization of our nation at war has become so complete that the services of nearly all scientific personnel in some way contribute to or support the war effort. Our colleges and their laboratories, our industries and their laboratories, and our government and its laboratories have become an integrated partnership in the prosecution of a war in which the full might of our scientific and technological capacity is brought to bear

upon the enemy. Thus, when an individual scientist, without complaint and without heroics of any sort, willingly relinquishes a higher paying and more conveniently located job in order to assume a particular wartime task, his decision to transfer more often than not is based on the higher need for his services in the new undertaking rather than because of any lack of contribution to the war effort in the position vacated. To the individual scientist, the question to-day is not "where can he serve" but "where can he serve best." Cold figures can not tell this story, but the enemy has already been made to understand it.

OBITUARY

WILLIAM SHIRLEY BAYLEY

WHEN the late William Shirley Bayley, professor of geology, emeritus, University of Illinois, graduated from the Male High School of the City of Baltimore at the age of seventeen, he was the recipient of a prize given by the Peabody Institute of the City of Baltimore "for fidelity to his studies and attainment therein, for correct moral deportment and personal habits, and for propriety of manners." A more accurate characterization of him could scarcely be written now. Some elaboration of his life, however, is quite appropriate.

He was born in Baltimore, Md., on November 10, 1861, the son of Robert P. and Emma Downing Bayley. On his father's side the family was of old Irish ancestry, and resided at Crossharm, Ireland. On his mother's side the family was English, dating back to Stephen Williams of Great Yarmouth, County Norfolk, in the sixteenth century. In 1637, Robert Williams, of the eighth generation removed, emigrated to Massachusetts, and subsequent members of his lineage filled places of trust and distinction in colonial affairs.

From high school young Bayley entered the Johns Hopkins University with a view to becoming a chemist, but he found increasing interest in the new and growing science of geology which offered opportunities for young men in both the field and the research laboratory. One time he tried to help his father out in his business of importing china, when his father was stricken with paralysis, but business life did not appeal to him and he returned to his studies. Receiving his A.B. in 1883 he continued his postgraduate studies, was awarded a fellowship in 1885–86 and received his Ph.D. degree in 1886.

From 1888 to 1904 he served as professor of geology at Colby College, where his popularity as a teacher and his devotion to research made him an inspiring faculty man. Among his students was the young George Otis Smith, who later became director of the U. S. Geological Survey. In tribute to Professor Bayley's teaching, Dr. Smith relates in the March, 1942, issue of *The Colby Alumnus* that in a Johns Hopkins laboratory in the course of his graduate work, a debate among the graduate students was closed by one of them remarking: "It isn't that 'G. O.' learned more geology in college than we did, but he didn't learn so much that wasn't so."

After teaching two years at Lehigh University, Professor Bayley was invited by President Edmund Janes James to come to the University of Illinois in 1906 where, from assistant professor of mineralogy and economic geology he rose to professor of geology in 1913 and head of the department in 1928, in which capacity he served until his retirement in 1931 with the designation of professor emeritus, thus completing twenty-four years of highly creditable service to the university. As a junior member of the department from 1919 to 1923, the present writer came to recognize his thorough-going teaching and his challenging attitude toward his students in stimulating their devotion to the highest ideals of science. Twenty years more of association with him personally and professionally made indelible these impressions of his critical guardianship of science.

But Professor Bayley was not only a teacher and a critic. He was a research investigator and writer of great merit. For many years he devoted his summers to intensive field work. Establishing an early connection with the U. S. Geological Survey as assistant geologist and later as geologist he did a great deal of work on the pre-Cambrian rocks and iron ores of the Lake Superior region in northeastern Minnesota and in northern Michigan. Many articles came from this work as it progressed, nine of them within six years, besides a continued series of five articles on the basic massive rocks of the Lake Superior region. Then came two extensive reports as junior author with Professor C. R. Van Hise on the Marquette iron-bearing district of Michigan in 1895 and 1897 and a monograph under his own authorship on the Menominee iron-bearing district of Michigan in 1904, besides more papers of increasing significance, including one on the water resources of Maine and two geologic atlases of areas in Michigan and New Jersey, which were in joint authorship with Van Hise and N. H. Darton, respectively. Seven other notable publications punctuated a total of forty-one scientific entries, ninety-seven book reviews and three text-books in his labor-won bibliography. The scope of his work embraced mineralogy, petrography, areal geology, under-

ground waters, economic geology, metalliferous deposits, clays and the history of geology, which was in widely distributed areas—Maine, New York, New Jersey, Birmingham, North Carolina, Tennessee, Georgia, Texas, Minnesota, Michigan and Canada. He was connected at one time or another with the state geological surveys of New Jersey, North Carolina and Tennessee.

Some of his life's energies were also devoted to certain scientific journals, having been associate editor of *American Naturalist,* 1886–87, reviewer for Neues "Jahrbuch für Mineralogie," Berlin, 1890–1908; and business editor of the *Journal of Economic Geology,* 1905–42. He was honored by being made councilor of the Mineralogical Society of America, 1931–34, and its president in 1936; councilor of the Geological Society of America in 1919 and 1937, and a vice-president in 1936; councilor of the Society of Economic Geologists, 1925–27, and vice-president in 1932. He was also faithful in promoting interest in science in his state of adoption and was honored with the presidency of the Illinois Academy of Science in 1922–23, during which office he sponsored the organization of a Junior Academy of Science for high-school students. He was always solicitous in safeguarding the educational interests and standards of the University of Illinois and served on important and influential committees. In recognition of Professor Bayley's scientific attainments and of his devotion to his alma mater he was selected by the Johns Hopkins University as a representative of its scientific alumni on the occasion of the celebration in 1927 of its fiftieth anniversary.

Although his death on February 13, 1943, is a real loss to science, all of us who knew him well and the many who knew only his work must feel a deep sense of gratification and inspiration in a life so full, so exemplary and so richly productive.

M. M. LEIGHTON
ILLINOIS STATE GEOLOGICAL SURVEY

RECENT DEATHS

DR. C. STUART GAGER, for thirty-three years, since its establishment, director of the Brooklyn Botanic Garden, died on August 9 at the age of seventy years.

DR. CHARLES MACFIE CAMPBELL, professor of psychiatry at the Harvard Medical School, died on August 7 at the age of sixty-six years.

DR. ARTHUR MONRAD JOHNSON, associate professor of botany at the University of California, Los Angeles, died on July 16 at the age of sixty-five years.

THE REVEREND ARTHUR J. HOHMAN, professor of chemistry and head of the department at St. Peter's College, Jersey City, N. J., died on August 3. He was fifty-six years old.

JAMES MOFFITT, curator of the department of ornithology and mammalogy of the California Academy of Sciences since 1936, while on active duty as a Lieutenant in the U. S. Naval Reserve was killed in an airplane crash at Dutch Harbor, Alaska, on July 2.

ALBERT W. WHITNEY, formerly consulting director of the National Conservation Bureau of the accident prevention division of the Association of Casualty and Surety Executives, from 1904 to 1913 assistant and associate professor of mathematics and insurance at the University of California at Berkeley, died on July 27. He was seventy-three years old.

JOHN WATSON ALFORD, consulting engineer of Chicago, died on July 31 at the age of eighty-two years.

ROBERT SPURR WESTON, of Rhode Island, consulting sanitary engineer, died on July 29 at the age of seventy-four years.

DR. ARTHUR NEIVA, head of the Division of Entomology at the Oswaldo Cruz Institute, died in Rio de Janeiro on June 6 at the age of sixty-three years.

SCIENTIFIC EVENTS

INDUSTRIAL RESEARCH IN GREAT BRITAIN

SIR EDWARD APPLETON, secretary of the British Department of Scientific and Industrial Research, in opening the new physico-chemical laboratories of the British Coal Utilization Research Association at Coombe Springs on June 23, is reported in *Nature* to have congratulated the association both on its new facilities in laboratory space and on the financial provision now available for large-scale work. Sir Edward said that the steps the association has taken are among the first notable signs of a great forward movement in industrial research in Great Britain, which he confidently expects will be one of the features of post-war Britain. The Coal Utilization Research Association is serving the coal industry as a whole, and he particularly welcomed the expression of the interest of the miners themselves, shown in the recent appointment of two members of the Mineworkers' Federation to the council of the association. It is, he said, fashionable nowadays to decry British industrial research effort, because it is claimed that the amount of money spent on research per head of population is less than that in certain other countries. Much depends, of course, on what basis such a calculation is founded; whether or not, for example, development costs are included under the heading of

research. Moreover, there can be unwise expenditure, as well as wise expenditure, even on research. But it can certainly be stated that British effort on research is not commensurate with our industrial needs. To talk merely of spending more money, however, was not enough. It was necessary to plan our attack on both new and old problems and, most important of all, to attract some of our best scientific brains in the country to solve them.

It has also been stated that, whereas Great Britain has, in the past, been responsible for many of the most fundamental discoveries in science, other countries have often been the first to apply them to practical ends. Sir Edward said that he could safely predict that when the full story can be told after the war, work in the application of science, as distinct from the accumulation of scientific facts, will be found second to none. He instanced the example of one of the most striking of our war-time developments, namely, that of radio-location, which was not, as is commonly supposed, a new invention. Here a technique developed for purely scientific ends has been magnificently applied by young British scientific workers to practical wartime uses. In this and other fields it has been amply demonstrated that the young men of Great Britain can hold their own in bridging the gap between laboratory science and its useful expression in appliances and industrial processes.

THE WARTIME CONFERENCE OF THE AMERICAN PUBLIC HEALTH ASSOCIATION

THE Wartime Conference and the seventy-second annual business meeting of the American Public Health Association will be held in New York City from October 12 to 14. The Hotel Pennsylvania will be headquarters. Health workers within easy access of New York City are invited to attend. Representation of distant areas will be provided by appointed delegates.

The local committee in charge of arrangements of which Dr. Ernest L. Stebbins, Health Commissioner of New York City, is chairman, includes: *Honorary Chairman,* The Honorable Fiorello H. LaGuardia; *Co-chairman,* Edward S. Godfrey, Jr., M.D.; *Secretary,* Leona Baumgartner, M.D.; *Treasurer,* Matthew Byrne.

The following have agreed to serve as chairmen of the sub-committees: *Finance,* Frank Kiernan; *Meeting rooms,* John Oberwager, M.D.; *Publicity,* Frank A. Calderone, M.D.; *Radio,* Iago Galdston, M.D.; *Reception,* John L. Rice, M.D.

Half-day special sessions will be held on the following subjects: Current health department problems in war; tropical and imported diseases; new ventures toward health security and postwar planning.

The tentative section programs list such topics as: The war physical fitness program, plasma reserves for civilian defense, conquest of industrial noise, syphilis and gonorrhea, meningitis, health of the army, diarrheal diseases, international vital statistics, aviation medicine, tuberculosis, the health education program in wartime, chemical warfare and the laboratory, tropical diseases and the laboratory, report of the commission on vital records, community emergency service and war industry, wartime problems of the county health officer, nutritive value of preserved foods, nutrition policy here and abroad, health standards for day care centers, wartime adjustments of school health personnel. There will be a "Convention by Radio" during which the resolutions, the transactions and as much as possible of the program of the Wartime Conference will be broadcast to members at home.

The September issue of *The American Journal of Public Health* will print the program. Further information may be obtained from the American Public Health Association, 1790 Broadway, New York 19, N. Y.

APPEAL OF THE WAR POLICY COMMITTEE OF THE AMERICAN INSTITUTE OF PHYSICS

THE War Policy Committee of the American Institute of Physics has outlined a program of post-war development for physics. Part of this program is a proposal to purchase a building to serve as an operating office for the institute, as a New York center available for the use of the Founder Societies, and as headquarters for the physicists of America. This proposal was approved and adopted by the governing board on July 24 and the committee was appointed to conduct a campaign to raise the necessary $75,000.

The society has grown from a hundred members in 1900 to over 6,000 members at the present time. Its immediate objects are given as follows:

(*a*) Improve meetings and strengthen journals.

(*b*) Cement the unity of the physics profession.

(*c*) Retain the loyalty of specialist groups and keep them identified with physics.

(*d*) Improve the teaching of physics at the high-school level.

(*e*) Expand, re-examine and improve physics training at the college and post-graduate level.

(*f*) Adopt suitable standards of professional competence and accredit training institutions.

(*g*) Bring increasing resources and facilities to the support of education and research in physics.

(*h*) Promote the employment of physicists in industry.

(*i*) Aid in the rehabilitation of war-interrupted careers of physicists and students of physics.

(*j*) Conduct an appropriate campaign on behalf of public appreciation of physics as a constructive peacetime activity.

(*k*) Inaugurate traveling lectureships, awards recognizing achievements, bulletins and other miscellaneous services as may be found desirable.

(*l*) Represent the profession of physics in informing and assisting legislators, and government executives considering laws and regulations affecting education, research and other activities of concern to physicists.

In making its appeal for funds the committee points out that it is an essential part of the proposal that there be acquired a permanent home for organized physics. The joint publishing and general cooperative operating department—the American Institute of Physics—has shown in its twelve years a consistent record of usefulness, reliability and increasing financial strength. It has always occupied rented office space. By virtue of the fact that it is a tax-free organization it could—if it had its own building—occupy and fully maintain much better and larger quarters at no increase in annual cost over the present rent.

It happens that at the present moment an extremely well-constructed and suitably arranged building has been offered for sale to the institute. It is conveniently situated on 55th Street between Madison and Park Avenues, New York, a neighborhood of excellent and improving value. If advantage is to be taken of this offer the sum of $75,000 must be guaranteed as soon as possible.

The appeal is signed by the War Policy Committee, the members of which are P. E. Klopsteg, *chairman*, O. E. Buckley, K. T. Compton, H. L. Dodge and R. C. Gibbs.

THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

THE *Harvard Alumni Bulletin* gives the following particulars in regard to the Office of Scientific Research and Development:

Once a year, a subcommittee of the Committee on Appropriations of the House of Representatives meets in Washington to consider requests for the following year for funds for the continuation of the National War Agencies. This is almost the only occasion when information of the work of the Office of Scientific Research and Development, which employs and uses so many Harvard scientists and laboratories and to which President Conant devotes so large a part of his time, enters the public record.

In the hearing on the 1944 bill, held on May 29, Vannevar Bush, doctor of engineering, 1916, director of the office, and President Conant were two of the key witnesses. In support of an appropriation of $125,000,000 for the National Defense Research Committee, the two men revealed that approximately $2,000,000,000 worth of equipment had either been secured or was on order by the armed services through the work carried on by the office as the result of previous expenditures. More than 200 devices, Dr. Bush said, had been officially adopted out of the research of the office, and many of these had already seen service at the battlefronts.

The scope of the work is indicated by the fact that from June, 1940, through April 17, 1943, a total of 1,731 contracts had been let among 124 different academic institutions and 205 different industrial organizations. The largest volume of work falls under the supervision of the National Defense Research Committee, of which President Conant is chairman.

Appropriations requested for the Medical Research Committee, of which Dr. A. N. Richards, of the University of Pennsylvania, is chairman, and Professor A. Baird Hastings, Hamilton Kuhn professor of biological chemistry at the Harvard Medical School, is a member, amounted to somewhat less than $10,000,000. Concerning the work of that committee, Dr. Richards was enabled to reveal some remarkable developments made under its auspices in the use of penicillin, the new bacteria-destroying product made from green mold, which is expected to rival the miraculous sulfa drugs. He reported use of the drug in badly wounded cases in the Pacific area, which had been under treatment without success for as long as fourteen months. Persistent infections showed remarkable improvement within a week. Many units of the drug are now under manufacture, and have been sent to British and American forces in the field. Concerning details of the work of Mr. Conant's committee on instrumentalities of the war, no corner of the veil of military secrecy was lifted.

Letters were read into the record by General Marshall, chief of staff of the Army, and by Admiral King, of the Navy, endorsing in wholehearted terms the services in the war effort of these civilian scientific groups working in cooperation with the Army and Navy.

MANPOWER PROBLEMS IN THE CHEMICAL INDUSTRY

A SYMPOSIUM on "Manpower Problems in the Chemical Industry" will be held in connection with the one hundred and sixth meeting of the American Chemical Society, which will take place at Pittsburgh from September 6 to 10. Dr. A. L. Elder, chief chemical adviser of the War Production Board, will preside.

Dr. Francis J. Curtis, development director of the Monsanto Chemical Company, will deliver an address on "How Industry is Solving its Manpower Problems"; James W. Raynolds, deputy director of the chemicals division of the War Production Board, will discuss "Production Requirements of the Chemical Industry"; Dr. Herman T. Briscoe, vice-president of Indiana University, will speak on "Training Programs for Chemists." Other speakers and their topics are: Dr. Warren L. McCabe, of the Carnegie Institute of Technology, "Training Programs for Chemical Engineers"; Dr. James Coull, of the University of Pittsburgh, "Training and Utilization of Women in the Chemical Industry"; Dr. Frank C. Whitmore, of the Pennsylvania State College, "Occupational Defer-

ment of Technically Trained Men in the Chemical Industry"; Sidney L. Kirkpatrick, editor of *Chemical and Metallurgical Engineering,* "Manpower for Post-war Developments in the Chemical Industry."

Dr. Elder has pointed out that

> The expansion program of the chemical industry is fairly well adjusted to the needs of the armed services. When the plants now under construction are completed, it is anticipated that only minor further expansion will be required to keep the program in balance. On this basis one might at first assume that our worries should be nearly over. Actually, for several months it has been becoming more and more apparent that our troubles were only beginning, for production was not equivalent to plant expansion. The reason for this was obvious to all, but the solution is yet to be found. Manpower problems are confronting one industry after another.

Other symposia scheduled for the Pittsburgh meeting, in which 4,000 scientific men and industrialists are expected to participate, will deal with industrial hygiene, research tools of the colloid chemist, research management in small laboratories, unit processes, paint and plastics, reactions of solids, molecular addition compounds, library research, recent advances in the chemistry of dairy products, vitamins, proteins and boron in agriculture.

SCIENTIFIC NOTES AND NEWS

THE Alvarenga Prize of the College of Physicians of Philadelphia has been awarded to Dr. Ernest C. Faust, professor of parasitology and acting dean of the School of Medicine of Tulane University of Louisiana, in recognition of his "outstanding contribution to our knowledge of parasitology and tropical medicine."

THE *Journal* of the American Medical Association reports that the Medal of the Aztec Eagle for services and work on military medicine was recently presented to Drs. Edgar Erskine Hume and Tomás Cajigas, Washington, D. C., honorary members of the Academia Nacional de Medicina of Mexico. Dr. Francisco Castilla Nájera, the ambassador of Mexico to the United States, made the presentation.

SCIENCE has reported the names of those American scientific men who have been elected honorary fellows of the Royal Society of Edinburgh. British fellows were elected as follows: The Right Hon. J. C. Smuts, Prime Minister, South Africa; Professor H. F. Baker, emeritus professor of geometry and astronomy of the University of Cambridge; Sir Joseph Barcroft, emeritus professor of physiology of the University of Cambridge; Sir Lawrence Bragg, Cavendish professor of experimental physics at the University of Cambridge. Other elections to honorary fellowships include Dr. D. Emilio Jimeno Gil, rector of the University of Barcelona; Professor Thore G. Halle, Naturhistoriska Riksmuseum, Stockholm, and Dr. P. Karrer, professor of chemistry and director of the Chemical Institute, Zurich.

WASHBURN UNIVERSITY, Topeka, Kansas, on May 24 conferred the honorary degree of doctor of laws on Dr. F. D. Farrell, retiring president of Kansas State College, formerly agronomist of the Bureau of Plant Industry, and the honorary degree of doctor of science on Dr. George P. Grimsley, geological engineer, retired, of the Baltimore and Ohio Railroad.

THE degree of doctor of laws has been conferred by St. Olaf College, Northfield, Minn., on Dr. Donald C. Balfour, director of the Mayo Foundation for Medical Education and Research, Rochester, and the degree of doctor of science on Dr. Adolph M. Hanson, Faribault, in recognition of work on the isolation of the active principles of various hormones.

DR. CLEMENT C. WILLIAMS, president of Lehigh University, has presented his resignation to take effect in 1944. Dr. Williams became president of Lehigh University in 1935, after having been on the faculties of civil and railroad engineering at the Universities of Colorado and Kansas, head of the civil engineering department of the University of Illinois and dean of the College of Engineering at the State University of Iowa.

DR. EDWARD C. ELLIOTT, president of Purdue University, has resumed his work after a leave of absence that began in June, 1942. Since then he has served as chief of the division of professional and technical training of the War Manpower Commission, and was instrumental in setting up the war-training programs for the Army and Navy in American colleges and universities.

THE retirement from active work with the title emeritus at the end of the summer quarter has been announced by the Ohio State University of Professors Harry W. Kuhn and Samuel E. Rasor, both of the department of mathematics; of Professor Andrews Rogers, of the department of obstetrics, and of Professor Clifford C. Huntington, of the department of geography.

WILLIAM PETERSON, director of the Utah Agricultural Experiment Station from 1921 to 1928 and director of the Extension Service from 1924, retired with the title emeritus on June 30. He will serve as adviser on agricultural problems. W. W. Owens,

assistant director of the Extension Service since 1920, was appointed to succeed him.

PROFESSORS BYRON E. COHN and Essie White Cohn have returned to the University of Denver from Washington. Dr. Byron Cohn has been in the research department of the Naval Ordnance Laboratory and will return as professor of physics. Dr. Essie White Cohn has been a visiting professor in biochemistry in the School of Medicine of George Washington University. She will return to her position as associate professor of chemistry. They will both serve in the instruction of the basic engineering unit of the Army Specialized Training Program.

DR. JAMES B. LOOPER, professor of anatomy at the University of Mississippi, has been appointed assistant dean of the School of Medicine.

DR. KIRK BRYAN, associate professor of physiography, and Dr. Derwent Whittlesey, associate professor of geography, at Harvard University, have been appointed, respectively, professor of physiography and professor of geography, as of July 1.

AT the University of Cincinnati, Dr. Charles K. Weichert has been promoted to a professorship in zoology and Dr. Francis E. Ray to an associate professorship in chemistry.

DR. LOUIS S. GOODMAN, assistant professor of pharmacology of the Yale University School of Medicine, has been appointed professor of pharmacology and physiology and chairman of the department of the College of Medicine of the University of Vermont.

DR. HENRY J. BARRE, of the department of agricultural engineering of Iowa State College, has been appointed head of the department of agricultural engineering of Purdue University. Dr. Barre will have under his charge teaching, extension and research.

DR. RUDOLPH G. MINARIK, of the Kimberly Clark Corporation, Neenah, Wis., has been appointed professor of mechanical engineering at Syracuse University.

DR. C. S. MAURICE, formerly of the department of geology of the University of Tennessee, more recently associated with Dartmouth College, has joined the faculty of William and Mary College, Williamsburg, Va.

DR. CHARLES H. DANFORTH, professor of anatomy at the School of Medicine of Stanford University, San Francisco, has been appointed honorary librarian of the California Academy of Sciences.

WALTER J. MURPHY, editor of *Industrial and Engineering Chemistry* and *Chemical and Engineering News*, publications of the American Chemical Society, has been appointed a member of the National Research Council, Division of Chemistry and Chemical Technology, for a period of three years.

DR. ERWIN E. NELSON, since 1937 professor and head of the department of pharmacology of the School of Medicine of Tulane University, has been appointed director of research in the experimental research laboratories of the Burroughs Wellcome and Company at Tuckahoe, N. Y.

DR. EDWARD D. DAVY, dean of the School of Pharmacy of Western Reserve University, has been appointed director of the pharmaceutical division of the Winthrop Chemical Company, with headquarters in Rensselaer, N. Y.

THE British Medical Research Council has organized a Penicillin Clinical Trials Committee. Its members are Professor H. R. Dean (chairman), Dr. A. N. Drury, Professor A. Fleming, Professor H. W. Florey, Dr. Percival Hartley, R. Vaughan Hudson, Dr. C. M. Scott, Dr. J. W. Trevan, Professor R. V. Christie (secretary) and Professor L. P. Garrod (assistant secretary).

IT is announced in the daily press that Sir John Anderson, Lord President of the Council and member of the British War Cabinet, has arrived in Washington. Sir John is the head of the central government organizations responsible for scientific research in the United Kingdom—the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council. He is also president of the Scientific Advisory Committee of the War Cabinet.

PROFESSOR SEMON SARKISOV, vice-president of the Scientific Medical Council of the U.S.S.R., and director of the Institute of the Brain, Moscow, spoke on July 15 on Soviet medical workers in the present war before the Royal Society of Medicine, London.

THE resolutions adopted by the council of the American Association for the Advancement of Science on the Science Mobilization Bill were printed in the issue of SCIENCE for August 6. The vote of members of the council, as reported in the *A. A. A. S. Bulletin* for August, was: Approval, one hundred and forty-six; opposed, five.

THE National Technical Meeting of the American Institute of Electrical Engineers will be held at Salt Lake City from September 2 to 4.

IN collaboration with the British Red Cross Society, according to *Nature*, arrangements have been made by

the Institution of Electrical Engineers for British prisoners of war in Germany to sit for the associate membership examinations held in May and November, 1942. There were nineteen such candidates who took the examination, or parts thereof, on one or other of the two dates, seven of whom were successful in passing Parts I and II, three in passing Part I only and one Part II only. Five others passed in single subjects, a special concession having been granted to prisoners of war to take one subject at a time if they so desired. A commendably high standard of marks was reached by the candidates. Seventeen candidates in Germany entered for the May, 1943, examination.

A REUTER dispatch from Chungking states that in his will, made in 1939, the late President of China, Lin Sen, bequeathed $500,000 (Chinese) for the promotion of scientific education for the specific purpose of sending Chinese students abroad to pursue advanced studies.

Nature reports that though the building of the Wellcome Research Institution suffered considerable damage by enemy action, its structure was unharmed and the two Wellcome museums can quickly be put into shape as soon as labor and materials become available after the war. While some of the objects in the Wellcome Historical Medical Museum were damaged, it has been possible to replace or repair most of them. The specimens and other valuable material in the Wellcome Museum of Medical Science remained comparatively intact. Both museums are now under the directorship of Dr. S. H. Daukes. A comprehensive scheme for the Wellcome Historical Medical Museum has been prepared and will be brought to completion as speedily as possible after the cessation of hostilities. The Wellcome Medical Library, comprising more than 150,000 volumes, will also be in the same building, and suitable accommodation will be provided for research workers so that both the library and collections may be readily available. The Wellcome Museum of Medical Science—which in the past has been much used by teachers, students and those engaged in post-graduate studies—will be reestablished in its entirety. The large lecture hall will be fully re-equipped, including film projection apparatus, and will then be available for scientific lectures and meetings.

DISCUSSION

THE SCIENCE MOBILIZATION BILL

SCIENCE is to be commended most highly for devoting some of its columns to the free discussion of the Science Mobilization Bill, S. 702. This legislation is of great importance to all scientific and technical people, and, finally, to all people of the nation. Full discussion will ultimately bring out the real issues related to this bill.

More than a thousand letters have come to me about S. 702. From these letters I find that the men of science favor the bill. The vested interests, and those who are influenced or controlled by the vested interests, are against it, and they are most unscientific in their attacks upon it.

In reading the series of letters that has appeared in SCIENCE, I am impressed with the fact that most of these letters are concerned with peripheral, irrelevant or misleading material. To illustrate, let me cite a part of the communication from Dr. Gustav Egloff, of the Universal Oil Products Company, in the issue for June 18. To support his contention against Professor L. C. Dunn that "95 per cent. of our scientific and technical manpower and facilities are now highly organized and coordinated to the single end of advancing the war effort," Dr. Egloff quotes percentages from William L. Laurence's article in *The New York Times* of January 3, 1943, but he carefully refrains from quoting the preceding sentence giving actual figures. This is the unquoted sentence: "A survey now being carried out by our research personnel reveals that between 80,000 and 100,000 scientists are working, with about 80,000 in industrial and 20,000 in university laboratories."

In the same letter, Dr. Egloff lists 231,571 scientific and technical personnel, exclusive of medical and dental personnel, registered with the National Roster of Scientific and Specialized Personnel. Dr. Leonard Carmichael, director of the roster, testifying before the Science Mobilization Committee last October, said that the number of scientists and technical men might be tripled with complete coverage, indicating that only about one third of the available people were then listed on the roster. Multiplying Dr. Egloff's figure by three, the total would be in the neighborhood of 695,000. If, then, Dr. Egloff's 95 per cent. of 100,000 people, or 95,000, are at war work, the total so engaged is only about 13½ per cent. This calculation is, of course, as ludicrous on the one side as Dr. Egloff's on the other. I give it only to show how figures can be used to mislead. Scientific and technical people who actually do the work know from their own experience and that of their associates the extent to which their talents are being used to prosecute the war.

Dr. Egloff, of the Universal Oil Products Company, also uses other interesting techniques in his fight against this legislation. I quote him:

> It is not too much to say that their passage [the two mobilization bills] might well be worth 100 divisions to our enemies.—*The Chemist*, April, 1943, page 229; *The Journal of Commerce*, April 12, 1943; *The Chicago Trib-*

une, March 14, 1943; the *Washington Times-Herald,* March 14, 1943.

Their passage would be worth 100 divisions to the enemy.—*The Chemist,* April, 1943, page 252.

The bill would be worth 100 divisions of trained, motorized troops to Adolph Hitler. *Chicago Tribune,* June 17, 1943.

Adolf Hitler wrote in "Mein Kampf":

. . . in the big lie there is always a certain force of credibility.

And:

. . . only constant repetition will finally succeed in imprinting an idea on the memory of the crowd.

So here we have Dr. Egloff, of the Universal Oil Products Company, using two of Hitler's techniques in his effort to defeat this bill. Also, it is significant to note that the *Chicago Tribune* and *Washington Times-Herald* gave strong play to his words.

I am deeply concerned that American men of science participate in a full discussion of this legislation: They alone can provide the advice and counsel to make the bill adequate to the national need.

The bill is based on five primary needs:

1. The need for a central independent agency of government devoted exclusively to the progress and expansion of science and technology, first to win the war and later to contribute to the peace. Science and technology need to be considered as a national resource, serving the interests of the nation as a whole and not those of select groups. Indeed, it is the only remaining sector of our public domain. This agency should be an independent arm of Government, eventually on the same footing as the established departments.

2. The need for integration of existing government research and development facilities. There are about 20 major and 40 minor bureaus in the Government devoted to research and development; their operation cost more than $557,000,000 last year. The excellent work of these groups should be so integrated as to widen the usefulness of their work and to provide a greater service to the public.

3. The need for active governmental support of fundamental research. The Government should give widespread support to basic research, by grants to existing non-governmental as well as governmental groups. This would apply particularly to universities and colleges, where fundamental research should flourish. Insufficient budgets have caused our educational institutions to depend increasingly on industrial grants and fellowships. This, to an alarming degree, has reduced much of university research to the status of handmaiden for corporate or industrial research, and has resulted in corporate control of many of our schools.

4. The need for a uniform and effective policy to achieve the fullest utilization of scientific and technical manpower in wartime.

5. The need to promote the use of government patents in the interest of the public. These patents are to be clearly distinguished from privately owned patents. They are of three types: Those derived from government research and development and assigned to a Federal Department or Bureau; those held by the Alien Property Custodian; those derived from non-governmental research financed by Federal funds.

The use of these patents needs to be promoted, and they should be administered for the public good.

I have long realized the basic importance to the welfare of the country of a free science and an expanding technology. I have long advocated a far-reaching program of governmental research. The experience of Federal agricultural research provides ample precedent for such a step. I have also observed that all advances in the public interest are fought bitterly by selfish interests. Examples have been the establishment of our public school system, public ownership of municipal water supplies, enforcement of sanitation of the milk supply, range and forest conservation, public ownership of power, and so on.

Scientific and technical men hold in their heads and hands the collective knowledge of the ages. Whose knowledge is it? This group, more than any other, can help achieve these purposes: To free technology for its maximum use in this technological war, and to free technology for the greater advancement of the American people.

HARLEY M. KILGORE

U. S. SENATE

SALMON CONSERVATION

I WISH to call attention to an article in "Discussion" in the March 12, 1943, issue of SCIENCE, entitled "The Fundamentals of Salmon Conservation."

The article in question has absolutely *nothing* to do with salmon conservation. The author, however, has taken advantage of the current food shortage to try to show some practical use for a pet experiment.

Just what difference could it possibly make to salmon conservation if ". . . the salmon with lateral line nerves bilaterally sectioned should be less apt to find their home stream than those with their lateral line nerves intact."

If the author merely wishes to discover what factor guides salmon in their return to their parent stream we have no quarrel with him. We do wish to point out, however, that his project should not masquerade either as a war-time food problem or even as a project fundamental to salmon conservation.

GEORGE A. ROUNSEFELL

U. S. FISH AND WILDLIFE SERVICE,
CAMBRIDGE, MASS.

TRANSLITERATION ONCE MORE

DR. DUNLAP makes an important point[1] when he calls attention to one source of confusion in the transliteration of words from languages not written in the Latin alphabet. The bad habit in question consists in taking over transliterations bodily from such languages as French or German even when these transliterations are no longer appropriate in English. For example, one might thus take over the French transliteration of the Arabic word for mountain, namely, *Djebel.* As Dr. Dunlap remarks, "Of course the *D* is essential in French but redundant in English, since the English *J* has the sound which can be written in French only by *Dj*."

It is important to call attention, however, to one important exception to the rule that foreign transliterations should not be taken over into English. It is a principle adopted by the United States Geographic Board that when the Latin alphabet is "habitually or alternatively" used in a "country, dominion, colony, protectorate, or possession" local official usage should be followed except where there is a different conventional English form. Even in the latter case the better practise is to follow the local form. This makes for simplicity in international usage. It is confusing when Polish speakers write *Waszyngton* for *Washington* and on the same principle it is better for us to write *Djibouti* (French Somaliland) rather than *Jibuti,* although this involves precisely the peculiarity of transliteration to which Dr. Dunlap objects.

Again, Dr. Dunlap errs when he implies that a transliteration such as the Chinese *Tao* is due to slipshod borrowing from a system of transliteration conventional in some other language. *Tao* is a spelling which follows the standard Wade system of transliteration—or Romanization as it is generally called in this connection. Sir Thomas Francis Wade (1818–1895) was a British diplomat who spent many years in China and was afterwards professor of Chinese at Cambridge. His system of Romanization is followed by the vast majority of American and English Sinologists, and attempts to alter it are looked on with disfavor. There is good reason for this; for *Tao* is not "sounded *Dow*" as Dr. Dunlap says. The initial consonant is a devoiced *d,* therefore approximately half way between our English *d* and *t* except that it is unaspirated. The diphthong actually glides from a variety of *a*-sound to a variety of *o*-sound. To write *Dow* instead of *Tao* would not be an unquestionable improvement.

The moral of all this is simple. For every language written with a non-Roman alphabet there exists a system of transliteration which is accepted as more or less standard by specialists in the field, such as the Wade system for Chinese or the Hepburn system for Japanese. In addition, geographical names have special principles governing their use. The careful writer will take the trouble to familiarize himself with these systems or else consult experts to learn the correct usage in a particular case. A respect for scientific accuracy demands this if confusion is to be avoided.

PAUL HANLY FURFEY
THE CATHOLIC UNIVERSITY OF AMERICA

[1] SCIENCE, 97: 400–1, April 30, 1943.

SUGGESTED CHANGE IN DESIGNATION OF "RENIN-ACTIVATOR" (HYPERTENSINOGEN) TO RENIN-SUBSTRATE (α_2 GLOBULIN)

LELOIR, Muñoz, Taquini, Braun-Menendez and Fasciolo[1] have suggested that the term "renin-activator" should be dropped. In discarding it, we believe that the considerations which have influenced our using and retaining the word should be presented as well as those which now prompt us to propose a new term for the same entity.

When Kohlstaedt, Helmer and Page[2] found that renin was not a vasoconstrictor (or pressor) substance except in the presence of another protein present in blood, they identified this other protein as "renin-activator" for the simple reason that in its absence renin was not active. Without any further implication, this observation led to discovery of the pressor substance called "angiotonin" by the North American investigators, Page and Helmer,[3] and "hypertensine" by the workers of South America, Braun-Menendez, Fasciolo, Leloir and Muñoz.[4] In the course of studies on the formation of angiotonin (hypertensine) from the mixture of renin and "renin-activator," evidence was obtained both in this country[5] and in South America[6] which indicated that the interaction was enzymatic and that the so-called "activator" was in fact the substrate. The Argentine group then proposed the use of the terms "hypertensinogen" or "hypertensine precursor" for the substance until that time known as "renin-activator." These terms they developed from the fact that the substance in question gives rise to the pressor substance "hypertensine." However, as has been pointed out editorially in the

[1] L. F. Leloir, J. M. Muñoz, A. C. Taquini, E. Braun-Menendez and F. S. Fasciolo, *Rev. Argent. Cardiol.,* 9: 269, 1942.

[2] K. G. Kohlstaedt, O. M. Helmer and I. H. Page, *Proc. Soc. Exp. Biol. Med.,* 39: 214, 1938.

[3] I. H. Page and O. M. Helmer, *Proc. Cent. Soc. Clin. Res.,* 12: 17, 1939.

[4] E. Braun-Menendez, J. C. Fasciolo, L. F. Leloir and J. M. Muñoz, *Rev. Soc. Argent. Biol.,* 15, 420, 1939.

[5] I. H. Page and O. M. Helmer, *Jour. Exp. Med.,* 71: 29, 1940.

[6] E. Braun-Menendez, L. F. Leloir, J. M. Muñoz and J. C. Fasciolo, *Rev. Asoc. bioquim, Argent.,* 5: 17, 1940.

Journal of the American Medical Association,[7] the term "hypertensine" does not follow North American practice in that its selection evidently is intended to imply its causal relationship to hypertension, a relationship which has not been completely established. Further, the term "urohypertensine" has been used to denote a pressor substance in urine which in all probability had nothing to do with hypertension.

Meanwhile, we had retained the non-committal term "renin-activator" and used it without particular reference to its enzymatic rôle, since it was desired to avoid solidifying concepts and terminology in advance of full and complete evidence of the nature and function of this substance. Plentl and Page[8] have now by kinetic analysis established beyond a doubt the enzymatic nature of the interaction of renin with a protein substrate, the so-called "renin-activator," and Plentl, Page and Davis[9] have gone on to show that this substance is identical with or moves with the same electrophoretic mobility as α_2-globulin. Even with this background of evidence, the otherwise attractive term "hypertensinogen" should not be adopted since, as noted above, the term "hypertensine" is unsatisfactory. Further, the suffix "-ogen" in enzyme chemistry usually refers to a mother substance which, by a molecular rearrangement, gives rise to another substance, often itself an enzyme, *e.g.*, pepsinogen, trypsinogen, etc.

Since it now seems desirable to discard the term "renin-activator" and since the evidence is at hand to substantiate the implications of the terminology, we suggest that the purely descriptive word "renin-substrate" be applied to this substance and that, when it is considered useful to indicate its presence in, or identity with, the protein fraction α_2-globulin, this be added as postscript and the term written "renin-substrate (α_2-globulin)."

I. H. PAGE
O. M. HELMER
A. A. PLENTL
K. G. KOHLSTAEDT
A. C. CORCORAN

SCIENTIFIC BOOKS

THREE MATHEMATICAL TEXT-BOOKS

Aircraft Mathematics. By S. A. WALLING and J. C. HILL. 189 pp. Cambridge: The University Press; New York: The Macmillan Company. 1942. $1.25.

Principles of College Algebra. By M. S. KNEBELMAN and T. Y. THOMAS. x + 380 pp. New York: Prentice-Hall, Inc. 1942. $2.50.

Differential Equations. By R. P. AGNEW. vii + 341 pp. New York: McGraw-Hill Book Company, Inc. 1942. $3.00.

THESE three books deal with essentially distinct domains of mathematical instruction, both as to the material included and the degree of mathematical knowledge presupposed. They have one important point in common, however. They aim at a genuine comprehension of the material covered rather than a mere training in the formal use of it. Having been written by highly competent teachers of mathematics, with a secure mastery of their subject, they are well adapted to the realization of this aim.

The first book covers material within the range of any properly trained first-year high-school student. In fact, since about a third of the book is devoted to arithmetic, some of the material should be review work for such a student. The other subjects treated may be classified as algebra, geometry and trigonometry, with numerical trigonometry and the use of logarithms in computation marking the upper limit of advancement. The book is frankly intended for the present emergency and selects such elements of mathematical theory and application as are essential for those entering on training for the Air Corps. However, the material is well integrated and arranged in order of logical development. The problems are well selected and pertinent to the aim of the book. Altogether, the authors have done an excellent job.

The second book is primarily suitable for a freshman or sophomore in college, though much of it would be valuable for a junior or senior student who had not previously received a good training in algebra. In view of the recent tendency to cut short the mathematical instruction in high school, and in college to get on as rapidly as possible to the elements of the calculus, there has been a neglect of the domain known generally as college algebra. On account of the importance of algebraic theory in many of the recent developments of theoretical physics, such a lacuna in mathematical training has become increasingly disadvantageous. The inclusion of a course dealing with the material of the book under review is thus seen as highly desirable in a proper scheme of mathematical education.

Professors Knebelman and Thomas have included all the classical topics of college algebra in their book and have given an unusually careful discussion of these. Other topics, not so generally treated, such as

[7] Editorial, *Jour. Am. Med. Asn.*, 120: 923–924, November 21, 1942.

[8] A. A. Plentl and I. H. Page, *Jour. Biol. Chem.*, 147: 135, 1943.

[9] A. A. Plentl, I. H. Page and W. W. Davis, *Jour. Biol. Chem.*, 147: 143, 1943.

matrices and linear dependence, are also included. On the whole, the book is thoroughly modern and pedagogically excellent. It is a valuable addition to available books in the field.

The third book falls in a somewhat more advanced field, being suitable for a junior or senior in college or a first-year graduate student who has had no systematic training in differential equations. A special effort has been made by the author to avoid mere formalism and to see that the student gets at the heart of the matter. This effort will undoubtedly be amply justified in the way of increased understanding on the part of students who make use of the book. The fundamental notions and theorems of analysis that have special significance in discussing the solutions of differential equations, such as the Riemann definition of the integral, the varied behavior of functions as to continuity and existence of derivatives, the widening of a class of functions by considering indefinite integrals of such functions, are introduced early in the book and effectively used thereafter. The choice of problems is excellent, and many of them furnish a good introduction to important applications of the theory.

A valuable feature of the book is the excellent discussion of Picard's method of successive approximations, both as a method of solving equations and as a means for proving existence theorems. This discussion includes the treatment of equations of higher order and of systems of equations. It rounds out in excellent fashion the theoretical side of the work.

From every point of view Professor Agnew's book is a noteworthy addition to available texts for an introductory course in differential equations. Its appearance will be welcomed by those who have occasion to conduct such a course and by students who need to pursue the subject on their own initiative.

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BIOCHEMISTRY AND MORPHOGENESIS

Biochemistry and Morphogenesis. By JOSEPH NEEDHAM. 785 pages. Cambridge: At The University Press. New York: The Macmillan Company. 1942.

ALTHOUGH this book is not a continuation of Dr. Needham's classical work in three volumes on "Chemical Embryology," published in 1931, it is a timely and worthy successor, still concerned with the relation between morphology and chemistry. There are many references back to the earlier work in lieu of repetition, and the present book includes within its treatment most of the advances in the field of chemical embryology that have occurred since 1931. It thus serves as a sequel to bring that subject up to date. It does more than this, however. The present book goes well beyond a descriptive account of the biochemistry of the developing embryo; it goes about as far as the present state of knowledge permits in attempting to analyze the causal aspects of morphogenesis by explaining the unknown in terms of the known or better known, including specific substances when possible. In effect, an integration of chemical embryology and experimental embryology is attempted, which means a meeting on common ground of biochemistry and morphology.

Since the beginning of the present century, and even earlier, it has been shown repeatedly by amputation, transplantation and other types of experiments on many kinds of embryos (and regenerating adults) that the developmental fate of a part of the egg or embryo may be profoundly affected by its physical proximity and relation to other parts. This dependence in differentiation has in many instances been taken to imply the existence of morphogenetic hormones. Morphogenetic hormones have indeed also been found in plants, in which they have in certain cases been more quickly and more readily identified than in animals. The influence of one part of an animal embryo on another is strikingly shown in the "inducing" or "organizer" action of the cells of the dorsal lip of the vertebrate blastopore, which impose the main primary pattern of differentiation of the embryo upon neighboring cells with which they come in contact. In 1931 Spemann demonstrated that destroying the living integrity of such cells by crushing had little or no effect upon their inducing activity, and Holtfreter and others soon found that the inducing activity survived boiling, which destroys enzymes. These far-reaching experiments banished the last remnants of any basis for the mysticism still occasionally associated with the inductor agencies and stimulated intensive attempts both to isolate inductor substances, in which Dr. Needham himself took the lead, and to further understand their action. Substances of known composition were found that possess inducing activity, although it is not yet certain whether they are the same agents that act naturally or whether they stimulate or release the natural agents.

The second and longest part of the book is devoted to a comprehensive and penetrating consideration of morphogenetic stimuli and their actions. There is clear recognition of the great rôle of the reacting systems that respond to the stimuli in ways not yet clearly understood. The account shows that great advances have been made and that many more are yet to be expected. It also reveals the great intricacy and complexity of the processes of development that have for so long intrigued, baffled and fascinated the mind of man.

In Part 1 the morphogenetic substratum is consid-

ered from the point of view of the chemical raw materials available for development. The lucid account of nutritional and other problems that eggs and embryos have solved in adapting to the limitations of their environment is a most interesting and valuable contribution to the study of evolution and natural history. Part 3 is devoted to the morphogenetic mechanisms, including the special metabolisms of embryonic life with its sequence of energy sources, etc., and also such general questions as dissociability, growth, polarity, etc. In considering growth, attention is focused on the relative proportions of constituent materials at different stages in the development of the individual and in widely different species.

The treatment is broad and inclusive throughout. While the book is primarily concerned with recent facts and concepts, these are constantly projected in perspective against historical and philosophical background. A spirit of optimistic mechanism pervades the treatment, and an old subject is admirably treated in the light of current knowledge under the picturesquely modern heading, "The Liquidation of the Entelechy." The concept of levels of organization is stressed, and finally a parallel is drawn between organic and social development.

Cancer and teratomatous tumors are considered in relation to the organizer phenomena. Striking chemical similarities and overlapping functions are noted among certain substances acting as sex hormones, carcinogens and primary organizers (evocators). Cancer appears to involve the problem of anomalous differentiation or lack of differentiation, and thus to be related to phenomena studied in experimental and chemical embryology. Students of cancer will wish to familiarize themselves with Dr. Needham's account and point of view.

The book is abundantly and well illustrated, and a convenient system of numbering the sections or subjects is employed. The quality of the paper, as in most recent books, is not up to pre-war standards. An interesting side-light on the creation of books in England under conditions of war was shown this winter at the Yale University Library when copies of the various steps in the preparation of this book, the manuscript, galley, page proof, microfilm of the corrected page proof, etc., were put on display. These copies had all been sent as they came into being to Dr. Ross G. Harrison as insurance against destruction of the originals.

Throughout, attention is called to probable future trends in research and to needed experiments yet undone. The bibliography is the most complete and extensive in existence since "Chemical Embryology" and includes references to recent reviews. This book represents a great accumulation of facts and a masterly synthesis of knowledge. It will be indispensable to the investigator and teacher alike.

DOUGLAS WHITAKER

SPECIAL ARTICLES

THIOURACIL IN THE TREATMENT OF THYROTOXICOSIS[1]

RECENT interest in the possible medical treatment of patients with thyrotoxicosis has been stimulated by the observations that certain sulfonamides, as well as thiourea[2, 3, 4] and its derivatives, induce a hypometabolic state when fed to rats for several weeks. The evidence that has been accumulated suggests that the lowering of the metabolic rate results from a decrease in the production of the thyroid hormone, which is presumably due to the action of these drugs on the thyroid gland. The latter becomes enlarged and hyperplastic, but its content of colloid is greatly depleted. The changes in the thyroid do not occur if the animal is fed desiccated thyroid or if a hypophysectomy is first performed. The above drugs do not interfere with the elevation of the metabolic rate induced by thyroxin or desiccated thyroid. The pituitary gland responds with the same type of hyperplasia as follows thyroidectomy.

Astwood[5] found that of a large group of sulfonamides and thiourea derivatives which he tested, thiouracil was the most effective in inhibiting the production of thyroid hormone. He used thiouracil in the treatment of three patients with thyrotoxicosis and in each case the metabolic rate returned to normal and the symptoms were relieved. However, when the drug was discontinued after one or two months, the manifestations of the disease reappeared. The course of one patient was complicated by the development of agranulocytosis.

During the last few months, we have used thiouracil[6] in the treatment of nine patients with thyrotoxicosis. This substance is a thiourea derivative with the following formula:

[1] From the Thorndike Memorial Laboratory, Second and Fourth Medical Services (Harvard), Boston City Hospital, and the Department of Medicine, Harvard Medical School, Boston.

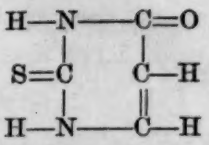
[2] Julia B. Mackenzie, C. G. Mackenzie and E. V. McCollum, SCIENCE, 94: 518, 1941.

[3] C. G. Mackenzie and J. B. Mackenzie, *Endocrinology*, 32: 185, 1943.

[4] E. B. Astwood, J. Sullivan, Adele Bissell and R. Tyslowitz, *Endocrinology*, 32: 210, 1943.

[5] E. B. Astwood, *Jour. Am. Med. Asn.*, 122: 78, 1943.

[6] Thiouracil was supplied through the courtesy of the Lederle Laboratories, Inc., Pearl River, N. Y.



It is a white crystalline powder which is readily soluble in sodium hydroxide, slightly soluble in water (1:2000) and insoluble in ether, ethyl alcohol and acids. It is a relatively stable compound, either as a solution or as a powder. It has no odor, but has a bitter taste.

Seven of the subjects were kept in the hospital for a few weeks and the other two were seen as out-patients at seven-day intervals. In most cases basal metabolic rates were determined about every seven days. A careful watch was maintained for any complications, the blood and urine being examined frequently. The unit dosage of thiouracil was 0.2 gram. During the first three weeks of treatment the total daily dosage was 1.0 or 1.2 grams spread out during the twenty-four hours; but during the second three-week period this was gradually reduced to about 0.2 or 0.4 gram daily. The daily excretion of thiouracil in the urine was followed in most cases and its concentration in the blood was determined.

All the patients had typical clinical manifestations of thyrotoxicosis. The duration of the illness ranged from six months to two years, except for one patient in whom it probably had existed for twenty-two years. In most cases, the thyroid gland was 2 or 3 times normal size. The early changes of malignant exophthalmos were observed in one patient. The initial basal metabolic rates ranged from plus 88 to plus 36 with an average of plus 63 (Fig. 1). In each case the

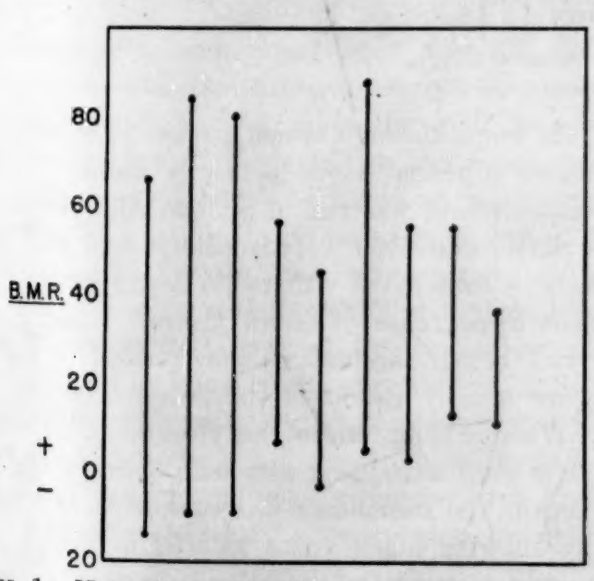


FIG. 1. Note the initial basal metabolic rates in each of nine patients and its response to treatment with thiouracil in each subject.

clinical evidence of thyrotoxicity had disappeared and the basal metabolic rates had reached normal levels (average metabolic rate was plus 1) within from three to seven weeks following the initiation of treatment with thiouracil. The severe cases improved as rapidly, or even more rapidly, than the milder cases.

In the four patients in which studies of the protein-bound iodine of the plasma were conducted there was found a decrease to a normal or subnormal level within about four weeks after beginning treatment.

In three patients the thyroid gland became slightly larger during the first two weeks of treatment but subsequently decreased to about the pre-treatment size. In the other six patients the gland progressively decreased in size and returned to normal in two cases. The patient with the early changes of malignant exophthalmos experienced an increase in the oculopathy during the course of treatment with thiouracil. However, when desiccated thyroid was administered with the thiouracil the eyes showed definite improvement and the thyroid gland became smaller.

No serious complications were encountered in any case. Two patients developed slight transient swelling of the legs associated with a slight increase in the serum chloride and a decrease in the carbon dioxide combining power of the blood. No abnormalities in the serum proteins, non-protein nitrogen of the blood, phenolsulphonephthalein in the urine, nor in the routine urine examinations were found.

In 2 patients with untreated myxedema, we found that thiouracil did not inhibit the usual rise in the metabolic rate induced by the administration of 1.5 grains, daily, of desiccated thyroid. The foregoing observations indicate that thiouracil does not interfere with the effects of thyroxin when it is administered in a preformed state, but rather inhibits the formation of the thyroid hormone.

The optimum dosage of thiouracil has not yet been determined. In an effort to throw light on this point we have studied the rate of absorption of the drug from the gastro-intestinal tract, its distribution throughout the body and its rate of excretion. The method employed for the estimation of thiouracil is that of Williams, Kay and Jandorf.[7] The absorption of the drug from the gastro-intestinal tract was found to be very rapid. For example, following the ingestion of 0.2 gram of thiouracil the maximal blood level of the drug was obtained fifteen minutes later. When it is given in doses of 0.2 gram at four-hour intervals, about twenty-four hours are required to reach a constant blood level and a constant rate of excretion of the drug in the urine. When this dosage is maintained for several days, the blood level is maintained at about 3 mgms per 100 cc and about 300 mgms per day are excreted in the urine. Most of the drug in the blood is in the cells, the white cells containing a

[7] R. H. Williams, G. A. Kay and B. J. Jandorf. To be published.

greater concentration, but a smaller total amount than the red cells. Studies are now being conducted to determine the optimum concentration of thiouracil in the thyroid and the time required to attain this level.

The present report is a preliminary one dealing with the early response of thyrotoxic patients to treatment with thiouracil. The assessment of the full value of this drug must await prolonged and extensive studies, including careful observations for signs of toxicity.

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EFFECT OF VARIOUS CHEMICAL AGENTS AFFECTING PERMEABILITY OF THE MUCOSA ON THE FORMATION OF ULCERS

SCHIFFRIN[1] produced ulcers in the cat by running a 3 per cent. solution of pepsin in 0.1 N hydrochloric acid through a segment of the jejunum, but was unable to bring about ulceration when the acid alone was used. He emphasized the important role of pepsin in the formation of ulcers and was able to prevent the lesions by protecting the mucosa with colloidal aluminim hydroxide and aluminim phosphate.

The purpose of the investigation reported here was to study the influence of certain substances known to have marked effects in lowering surface tension or in otherwise increasing permeability of the mucosa to insulin, on the incidence and extent of the ulcerations initiated by pepsin and HCl. Chemically pure pepsin and insulin have similar molecular weights (unit weights by the ultra-centrifuge).

The method used in these studies was as follows. An incision was made in a dog under dial-urethane anesthesia, and the jejunum was brought to the surface of the abdomen. Three or 4 segments about 3 inches long, chosen in such a manner as to insure a good blood supply to each loop, were cannulated and reinserted into the abdomen, which was then closed. Solutions, preheated to 37° C., were allowed to flow by gravity through the loops at the rate of 3 cc per minute for 12 hours, or until a perforation occurred in one of the loops. The loops were then removed, split along the mesenteric line and examined grossly and microscopically. Thirty-two dogs were used. The particular loops used were not examined for spontaneous ulcers before perfusion, because to do so would require sacrifice of them before the experiment. However, in a large number of normal dogs used in this and other investigations[2] the spontaneous occurrence of a discrete ulcer has never been seen.

The concentrations of the substances used were: 0.1 N hydrochloric acid, 2 per cent. powdered U.S.P. Merck pepsin, 0.03 per cent. calgon (sodium hexametaphosphate), 0.1 per cent. hexylresorcinol, 0.05 per cent. pinacol (tetramethyl glycol), and 1 cc of methyl salicylate per liter of solution.

RESULTS

Table 1 gives the number of times a given solution was tried, the number of times ulcers were formed, and the percentage of this occurrence with the various solutions. Also included are the pH's of the solutions.

TABLE 1

OCCURRENCE OF ULCERS IN PERFUSED LOOPS

Solution	pH	Number of loops used	Number of times loops used appeared with ulcers	Percentage occurrence of ulcers
2 per cent. pepsin in distilled water	3.80	3	0	0
0.1N HCl	0.90	4	0	0
0.1N HCl and 0.1 per cent. hexylresorcinol.	1.05	3	0	0
0.1N HCl and 0.1 per cent. methyl salicylate	1.00	3	0	0
0.1N HCl and 0.03 per cent. calgon	1.15	6	1	16.6
0.1N HCl and 0.05 per cent. pinacol	1.00	3	1	33.3
0.1N HCl and 2 per cent. pepsin	1.10	22	6	27.3
0.1N HCl and 2 per cent. pepsin and 0.1 per cent. methyl salicylate	1.00	8	4	50.0
0.1N HCl and 2 per cent. pepsin and 0.1 per cent. hexylresorcinol.	1.10	13	7	53.0
0.1N HCl and 2 per cent. pepsin and 0.03 per cent. calgon	1.10	13	9	69.2
0.1N HCl and 2 per cent. pepsin and 0.05 per cent pinacol	1.10	7	5	71.4

In the loops through which pepsin alone was run the tissue appeared to be perfectly normal. When hydrochloric acid was run alone, the villi were sometimes partly destroyed. Hydrochloric acid with pepsin usually caused the villi to be destroyed with the frequent appearance of small ulcers. Hydrochloric acid with hexylresorcinol, calgon, pinacol or methyl salicylate usually produced some destruction of the villi. When calgon, pinacol, hexylresorcinol or methyl salicylate were introduced with both hydrochloric acid and pepsin, the submucosa was completely destroyed, usually showing black areas, as well as a high percentage of ulcers. On numerous occasions as many as 10 to 15 ulcers would appear in one loop when either of these compounds was used with HCl and pepsin. This was never the case when they were not used.

[1] M. J. Schiffrin, *Proc. Soc. Exp. Biol. and Med.*, 45: 592, 1940.

[2] R. L. Driver and J. R. Murlin, *Am. Jour. Phys.*, 132: 281, 1941.

Discussion

For a long time it has been a mystery to physiologists why digestive juices of the stomach ordinarily do not digest the tissue which goes to form the alimentary canal while ingested tissue is readily digested. Driver and Murlin[2] showed that certain substances can increase the penetrability of intestinal mucosa by a protein molecule, insulin, as judged by its effect on blood sugar. Of these compounds, all that have been tried, namely, calgon, hexylresorcinol, pinacol and methyl salicylate, brought about a tremendous increase in the number and severity of ulcers.

Calgon is a compound noted for its ability to tie up calcium ions.[3] Since this ion has been reported to inhibit absorption[4,5] and since calgon was found to promote the absorption of insulin,[2] it seemed reasonable to expect an increased penetrability by pepsin with a consequent incidence of ulcers when calcium was rendered non-ionic and therefore non-absorbable in the intestine. Calcium combines with lipids and proteins to produce a hardening and protective effect on the mucosa. It is not inconceivable that the beneficial effects of milk in the treatment of ulcers may be attributed in part to its calcium content, and it would seem that fortification of milk with a calcium salt is indicated.

Hexylresorcinol is a powerful surface tension lowering agent and produces structural changes in the membranes of the mucosa which modify permeability.[2,6] Methyl salicylate exerts a special irritating influence on mucous membranes which increases permeation of protein molecules. Pinacol has little irritating effect and does not lower surface tension appreciably. This compound probably changes the penetrability of the mucosa by proteins by its particular molecular configuration, the hydrophobic and hydrophilic groups acting as a lock and key mechanism. The formation of ulcers in these experiments was not due to a difference in pH of the solutions. We conclude that substances which increase the permeability of intestinal mucosa by a lowering of surface tension or other means facilitate the formation of ulcers.

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University of Kentucky

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ON THE STAINING OF YEAST SPORES

Although it may be unnecessary to resort to staining procedures to demonstrate spores in some cultures of yeasts, frequently such stains are desirable for proof of the presence of spores or the proper delineation of these. As no one method of staining is used universally, each investigator uses the method of his choice, and this often is one of the methods used for bacterial spores. Thus, Henrici,[1] in a comprehensive review of the cytology and taxonomy of the yeasts, recommends the familiar technique of Moeller. This consists of primary staining with steaming carbol fuchsin, and, after proper destaining, counterstaining with Loeffler's methylene blue.

The above method, as used by the author, often gives slides with considerable precipitate, and frequently color differentiation between spore and vegetative cell is not clear. It seemed possible that the malachite green technique of Schaeffer and Fulton[2] might be more satisfactory since one step, the destaining procedure, is unnecessary. In this technique washing with water is sufficient to remove the primary stain from the vegetative cell. Only a few trials were needed to verify this assumption. Exceptionally clear differentiation was the usual result. Review of the literature revealed that Shimwell[3] had tried the technique with yeasts, although he modified the procedure by using alcohol as a destaining agent. Our results have not indicated the need for this.

The use of 5 per cent. malachite green as suggested by Schaeffer and Fulton for bacterial spores proves somewhat expensive if large numbers of slides are to be stained, as for example, in student laboratory exercises. It is possible to lower the concentration of the dye, and thus reduce the cost of the stain. This and other modifications have produced a staining technique with which we have had uniformly good results with spores of various yeasts. The brilliant contrast between the color of the spores and vegetative cells permits rapid identification, and is so striking that the novice experiences no difficulty in interpretation. In this laboratory, it has been much more successful than the technique of Gray[4] which employs a mixture of malachite green and basic fuchsin.

A number of modifications of the details of the Schaeffer and Fulton formula and procedure have been tested and the formula given below seems to be

[1] A. T. Henrici, *Bact. Rev.*, 5: 97–179, 1941.
[2] A. B. Schaeffer and M. Fulton, Science, 77: 194, 1933.
[3] B. H. Gilmore, *Ind. and Eng. Chem.*, 29: 584, 1937.
[4] E. Gellhorn and A. Skupa, *Am. Jour. Phys.*, 106: 318, 1933.
[5] H. Drawert, *Ber. Deutsch. Bot. Ges.*, 55: 380, 1937.
[6] R. Höber, M. Andersh, J. Höber and B. Nebel, *Jour. Cell. Comp. Physiol.*, 13: 195, 1939.
[3] J. L. Shimwell, *Jour. Inst. Brewing*, 44: 474, 1938.
[4] P. H. H. Gray, *Can. Jour. Research*, 19: 95–98, 1941.

optimum. Considerable variation in the application of the solutions is possible, and may be necessary with individual cultures, but it is believed that the method suggested will fail only in rare instances.

The solutions needed are as follows: (1) 1 per cent. malachite green dissolved, without heating, in 1 per cent. phenol, and (2) 0.5 per cent. aqueous safranin. The technique suggested for yeast spores is as follows: prepare smear on clean slide, air dry and fix lightly with heat of a Bunsen flame. Cover entire slide with malachite green solution and steam (do not boil) with a low Bunsen flame for two minutes. Wash in a gentle stream of tap water for one minute. Counterstain for 30 seconds with aqueous safranin. Yeast spores, upon examination, appear green, while the asci are a deep pink. With this method, less satisfactory results are obtained with bacterial spores, but further studies are in progress with reference to this question.

L. S. McClung

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ENZYMATIC CLEANING OF BERKEFELD CANDLES USED IN THE FILTRATION OF HUMAN BLOOD PLASMA

In instances where filtration was desired in the treatment of plasma it was observed that the pores of new filter candles would clog after slight use and would rarely recover their initial filtering capacities after cleaning and sterilization. Even though preliminary filtration processes were employed the filtering capacities of the candles continued to be impaired.

The filtration was accomplished by pressure in a stainless-steel pressure-chamber having a 10-liter capacity employing 8″ × 2″ Berkefeld candles. New Berkefeld "V" candles would filter about 6 liters of plasma before clogging. And new Berkefeld "W" candles would clog after 1½ to 2 liters of plasma passed through them.

The candles were treated by the following methods:

(A) 1. Backwashing with saline (0.85 per cent.) followed by a thorough scrubbing with a moderately soft brush. 2. Further backwashing with tap water while gently brushing the candle. 3. Boiling the candle in 2 per cent. washing soda for 30 minutes. 4. Boiling in tap water 30 minutes, changing water several times. 5. Cooling and brushing gently under tap water. 6. Backwashing with water. 7. Drying by suction for 10 minutes followed by exposure in a 100° C oven. 8. Sterilization in dry wall oven or autoclave.

(B) 1. Backwashing with saline (0.85 per cent.) followed by a thorough scrubbing with a moderately soft brush. 2. Further backwashing with tap water. 3. Boiling ½ hour in 1 per cent. sodium bicarbonate. 4. Boiling in two changes of distilled water. 5. Cooling and brushing gently under tap water. 6. Drying by suction for 10 minutes followed by exposure in a 100° C oven. 7. Sterilization in dry wall oven or autoclave.

After processing the Berkefeld candles by either of the above methods the "V" candles would only filter about 1 liter and the "W" candles about ½ liter before clogging.

To meet the existing problem the following technique of pepsin digestion was employed in the cleaning of the filter candles and has proven itself to be very satisfactory: Candles were backwashed with saline, followed by a thorough scrubbing with a moderately soft brush while flushing with tap water. The remaining water was blown out by compressed air and the candles submerged in a porcelain container[1] in which 0.5 per cent. pepsin (U.S.P. XI) had been dissolved in aqueous 1 per cent. hydrochloric acid (C.P.). The candles covered by the acidulated pepsin solution were incubated overnight at 37° C, thoroughly backwashed with water while being scrubbed with a moderately soft brush, the water blown out by compressed air, wrapped in heavy paper and sterilized in a dry wall oven or autoclave.

The "V" and "W" Berkefeld candles thus treated were capable of efficiently filtering 8 to 10 liters of human plasma using the positive pressure apparatus. The rate of flow of the "V" candle (one liter every 10 minutes) was approximately twice that of the "W" candle (one liter every 20 minutes).

Summary

Berkefeld candles clogged by human blood plasma were cleared by enzymatic action. Candles incubated in acidulated aqueous pepsin solution, thoroughly rinsed in water, dried and sterilized were capable of efficiently filtering 8 to 10 liters of human blood plasma.

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[1] Vegetable pan from electric refrigerator was employed.

BOOKS RECEIVED

Luhr, Overton. *Physics Tells Why.* Illustrated. Pp. ix + 318. The Jaques Cattell Press. $3.50.

Mursi, Zaki. *Tables of Legendre Associated Functions.* Pp. viii + 283. Fouad I University, Zaafaran Palace, Cairo, Egypt.

Reed, Alfred C. and J. C. Geiger. *Handbook of Tropical Medicine.* Pp. ix + 188. Stanford University Press. $1.50.

Taylor, Lloyd William. *Fundamental Physics.* Illustrated. Pp. xii + 662. Houghton Mifflin Co. $4.0

Wriston, Henry M. *Challenge to Freedom.* Pp. 240. Harper and Brothers.